

OBSERVATIONS ON A LOCALIZED DUCK SICKNESS IN THE DELTA MARSH; SUMMER, 1964

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THE 33,000-acre Delta Marsh, in south-central Manitoba, lies at the southern end of Lake Manitoba and is an important part of the waterfowl breeding area of Manitoba. Between the lake and the marsh, some nineteen miles of narrow, sandy, wooded ridge offers protection from strong winds and wave action from the lake.

The marsh is a series of shallow bays and sloughs connected by small waterways with only two outlets to the lake— a channel at Delta in the west and Clandeboye Dam in the east. The water level of the marsh is greatly affected by strong winds. Covering most of the marsh is a vast stand of phragmites (*Phragmites communis*). This plant is rarely found in water exceeding one-half meter in depth during the summer. Close to the phragmites, and often growing on islands are bulrushes (*Scirpus*) and, occasionally, cattails (*Typha*). In the deeper waters, sago pondweed, water milfoil, coontail, and other aquatic plants form beds that sometimes make it difficult to canoe.

In past years, serious outbreaks of duck sickness at Delta were, in most cases, attributed to avian botulism. H. Albert Hochbaum, Director of the Delta Waterfowl Research Station, notes that no major outbreaks occurred there before 1957. However, in 1957 there was a serious outbreak in which losses in the Lake Manitoba basin numbered about 500,000 ducks. Dying birds were found everywhere there was exposed shoreline that was reflooded by wind and rain. Since then, only small outbreaks have occurred.

On 3 August, 1964, an outbreak was reported at 22 Bay, a small body of water above five miles east of Delta. It was evident from the decomposed bird carcasses that the initial outbreak had occurred on about 20 July. The lack of laboratory facilities made it impossible to determine that *Clostridium botulinum* (Type C) was indeed the lethal agent in the 1964 outbreak.

22 Bay is located about one-half mile south of Lake Manitoba, and is approximately five-eighths of a mile across at its widest point. The vegetation is typical of the Delta Marsh, having a phragmites border, bulrush islands, and floating aquatics in open water. The bay is fed by one ditch and has outlets to a larger body of water (Blackfox Lake) to the south and a small bay to the east. The entire perimeter at the time of the study was surrounded by exposed mudflats of varying size.

The bay was divided into five study units (I–V, Table 2), each of which was composed of approximately 150 to 175 yards of exposed mudflats, shoreline, and islands. The units were checked in regular sequence as often as

TABLE 1
SEX, AGE, AND CONDITION OF DUCKS FOUND AT 22 BAY, 1964

Species	Ad.♂	Ad.♀	Juv.♂	Juv.♀	Downy*	Und.**	Flight-less	Sick	Total
Pintail	89	33	15	11	2A, 2A	15	32	18	165
Blue-winged Teal	89	38	10	20		10	7	13	167
Mallard	67	12	6	2		15	9	14	102
Gadwall	28	3	1		1A, 1A, 2A	3	19	3	38
Green-winged Teal	25	16	1			2	5	5	44
Shoveler	4	1	1	3		2	2	1	11
Am. Widgeon	18					4	14		22
Redhead	8	1			1A, 1A	1	4	1	12
Canvasback	1	1			1A, 1A	1	2		5
Black Duck	3		1					3	4
Ruddy Duck	2								2
Ring-necked Duck	1								2
Lesser Scaup						1			1
Unidentified									92
Totals	337	105	37	38	9	54	94	58	666

* Refers to brood class. (Gollop & Marshall, 1954. 1A, downy young, no feathers visible; 2A, partly feathered as view from side.)

** Unidentified as to sex and age.

possible, usually every day. Dead and sick birds were sexed, aged, and taken back to the station for dissection and examination. The upper digestive tract was immediately removed and preserved in 10 per cent formalin so that animal matter present would not be further digested. The report of this analysis is not yet available.

The mechanism involved in the production and release of the bacterium *Clostridium botulinum* (Type C) appears to be closely associated with fluctuating water levels and the presence of large numbers of marsh flies (Chironomidae). Both of these conditions prevailed at 22 Bay. Strong winds caused water level fluctuations up to eight feet throughout most of August.

The weather during August was quite variable. Most of the month was rather cool. Early morning temperatures were usually in the high 40's, and day readings ranged in the 60's and 70's. The bay was checked from 4 to 25 August: on 12 of these days sick or dead birds were found. Occasionally, it was impossible to check every day, so some of the dead birds reported on certain dates may have been alive the day before. Tables 1 and 2 show the findings.

Botulism deaths result from two main causes: (1) a massive dose of toxin ingested while eating insect larval cases and (2) the ingestion of repeated sublethal doses of toxin plus food in water containing large amounts of dissolved salts (Cooch, 1964). *Clostridium botulinum* (Type C) blocks the parasympathetic nervous system and thereby affects gland function. Ob-

TABLE 2
BIRDS OTHER THAN DUCKS FOUND AT 22 BAY AND BLACKFOX LAKE, 1964

Species	Total number	Sick	Study units					Blackfox L.
			I	II	III	IV	V	
Lesser Yellowlegs	54	10	18	3	6	5	5	17
Greater Yellowlegs	1	0	1					
American Avocet	1	0	1					
Dowitcher	8	4	2	1	1	2		2
Killdeer	1	1	1					
Semipalmated Plover	3	3	1				1	1
Pectoral Sandpiper	43	6	2	5	4	17	1	14
Least Sandpiper	15	8	3		1	1	3	7
Semipal. Sandpiper	24	16	10	1	2	2	4	5
Stilt Sandpiper	8	6	1		3	1	1	2
Spotted Sandpiper	3	2	2					1
Wilson's Phalarope	1	0						1
Ring-billed Gull	14	8	3	5		5		1
Franklin's Gull	6	0		1		2	3	
Bonaparte's Gull	4	0		4				
Black Tern	7	1	1	1				5
Forster's Tern	1	0	1					
Bl-crowned Night Heron	1	0			1			
Am. Coot	18	2	4		5	1	1	8
Pied-billed Grebe	2	0			1	1		
Eared Grebe	2	0	1		1			
Red-necked Grebe	1	0					1	
Marsh Hawk	1	1						1
Totals	219	58	52	21	25	37	20	65

served symptoms of sick birds at 22 Bay were the following: loss of ability to fly; paralysis in legs; diarrhea; non-functioning nictitating membrane; and complete collapse.

During the time of the outbreak, waterfowl usage of 22 Bay was quite intensive. Pintails (*Anas acuta*), Blue-winged Teal (*Anas discors*), Mallards (*Anas platyrhynchos*), American Widgeons (*Mareca americana*), Gadwalls (*Anas strepera*), and American Coots (*Fulica americana*) made up the bulk of the waterfowl. Lesser Yellowlegs (*Totanus flavipes*), Dowitchers (*Limnodromus* sp.), Semipalmated Sandpipers (*Ereunetes pusillus*), and Pectoral Sandpipers (*Erolia melanotis*) were the most common shorebirds. The peak population on 22 Bay occurred around the first week in August when about 1000 to 1500 birds were present. A few duck broods were still utilizing the open water during the first 10 to 14 days of August. Most of these were Redheads (*Aythya americana*). An increase in the number of shorebirds (more specifically, the "peeps"), gulls, and terns was noted. By the third week of August, about 1100 White Pelicans (*Pelecanus erythrorhynchus*) were

using the bay and Blackfox Lake as well as other parts of the marsh. Also at this time, the number of ducks, especially Pintails, decreased. There was a slight increase in Shovelers (*Spatula clypeata*) toward the end of the third week. Herons, rails, and Marsh Hawks (*Circus cyaneus*) also used the area. Evidence of muskrats, skunks, and raccoons was found along the mudflats. Skunks and raccoons appeared to have eaten many of the dead birds and it is likely that several sick birds were taken. On several occasions, Marsh Hawks were observed eating both dead and freshly killed birds.

The numbers of birds affected by the sickness were directly proportional to the numbers utilizing the area. The sickness was non-selective as to sex and age. With the exception of rails, all the species in 22 Bay were affected by the sickness. However, it is quite likely that some rails were killed. Blue-winged Teals and Pintails were the birds most commonly seen feeding along the edge of the bay and; as the data show, these two species accounted for more than half the dead ducks (332 of 574). The Mallard was the third most common species at the bay edges and also ranked third among the birds affected by the sickness.

SUMMARY

An isolated outbreak of duck sickness was studied in the Delta Marsh, Manitoba. Evidence suggests that the bacterium *Clostridium botulinum* (Type C) was responsible for the deaths of 885 birds found at 22 Bay. The deaths were closely associated with fluctuating water levels. The ducks found most numerous in the kill were the Pintail, Blue-winged Teal, Mallard. Among the ducks represented, a large proportion (76:24) were drakes; however, for juvenile birds, a nearly perfect 50:50 ratio existed. Other species, including shorebirds, gulls, terns, herons, grebes, Coots, and Marsh Hawks were found sick.

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